Overview of the Ho'alauna Tablet

A new technology solution that will enable Hawaii’s seniors to remain connected to their family, friends and community; control their home environment; and manage their healthcare

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"By 2025, the number of people age 65 and over throughout the world will nearly double, while the number of children will increase just 3 percent. In the United States, the elderly population is expected to jump nearly 80 percent, and working-age adults and children, 15 percent. " US Census Bureau US Census Press Releases Feb.2004 “

Introduction

For many people, the process of growing older is one of continual change. Decreasing physical and cognitive abilities make many familiar activities difficult or even impossible to perform. Adapting to new challenges is a major factor in aging successfully and, while some people manage this easily, there are many who require help. Traditional ways for providing this help usually involve some form of institutional setting in which the person receives the necessary help at the cost of losing some individual independence. While this approach has worked reasonably well in the past, it is no longer viable due to escalating costs, lack of facilities and a global shortage of young people available to work in the institutions.

We believe the most promising strategy for alleviating the problems looming over an aging population is to develop technologies that enable aging people to remain active and independent in their own homes for as long as possible. Achieving this will require detailed attention to many different facets of daily living. Some of the necessary technologies have already been developed for other populations such as physical disabilities or blindness. There are also many technologies related to personal computers and the World Wide Web that could be adapted to assist aging people. While it is possible to cobble together pieces of these existing technologies to create individualized solutions for aging people, the results are often complex and confusing. We do not consider this to be a viable strategy for providing long-term answers.

In this paper, we describe a solution that has evolved over many years of research into developing simple, reliable ways for people to interact with computer-based devices and information technologies regardless of their personal needs, abilities, culture and preferences. The Ho'alauna Tablet (“Good Neighbor”) is a simple computer-based device designed specifically for aging people. In addition to providing communication, organization, social interaction and control functions, it implements “Lifelong Learning” strategies that enable users how to cope with new challenges wherever and whenever they are encountered.

Recognized Problems

Hawaii is the third most rapidly aging state in the Nation. According to the Hawaii Summit 2001, " Between 1990 and 2010, the 60+ group is projected to grow by 72 percent to 299,500 persons, while the 85+ group will grow by 286 percent to 40,120 persons." These demographic shifts in the proportion and number of elderly people in society are part of a global phenomenon that will impact every institution, from medical care to transportation and employment.

Seventy percent of seniors in Hawaii live in their own homes with about eleven percent of them living alone. Many face social isolation and loneliness as a result of being unable to travel or to participate in local events. The people who can no longer look after themselves may be forced to move in with other family members or to move into elderly care facilities. The decision to remove a person from his or her familiar surroundings depends on many factors but, unfortunately, it is often triggered by an isolated event such as a personal hygiene accident, wandering off and getting lost, or a medical crisis resulting from forgetfulness or confusion over taking medication. Appropriate technology can prevent such situations from developing.

Experts are predicting significant changes in living patterns over the next 50 years. It will be necessary for people to continue working until they are older. Everyone will be forced to utilize public transportation to a much greater extent than they do now. There will be a critical shortage of caregivers and nursing attendants due to the global shrinking in the proportion of young able-bodied workers. People who are no longer able to look after themselves in their own homes may be able to move into assisted living facilities but it is likely that the bulk of the assistance will be provided by technology rather than by individual caregivers.

The young people of today will be working in a world that must support a large population of elderly people. Microsoft recently commissioned Forrester Research to conduct a research study entitled**,** "The Wide Range of Abilities and Its Impact on Computer Technology"**.** One of the important findings in this study was that "*In 2010, the majority of the US population will be 45 years and older; a change that represents a major turning point for the US population demographic*." The youth of today will be managing and working along side of many more elders than in previous generations. So far, however, little has been done to prepare and educate youth about the special needs of the elderly. As the recently educated labor force, they will be responsible for the development of new technologies, upgrading transportation and physical infrastructure to meet not only their needs, but also the needs of those who are living longer. They will be responsible for providing healthcare and care giving for elderly people with fewer available workers. It is important to develop programs that provide interaction between elderly and youth so that the young can become familiar with the needs of their future society.

P41. Age by Types of Disability for the Civilian Noninstitutionalized Population 65 Years and Over With

Disability status of the civilian noninstitutional population - Numbers — See Percentages below
Note: A person may have more than one disability
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geography	Civilian noninstitutional population 65 years and over	Persons with any disability	Persons with a Sensory disability	Persons with a Physical disability	Persons with a Mental disability	Persons with a Self-care disability	Persons with a Go-outside-home disability
		Number	Number	Number	Number	Number	Number
U.S. Total (50 States+DC)	33,346,626	13,978,118	4,738,479	9,545,680	3,592,912	3,183,840	6,795,517
Total (50 States, DC, PR)	33,763,844	42.1%	14.3%	28.8%	10.9%	9.6%	20.6%

Figure 1. Census 2000 data on disabilities among the noninstitutional U.S. population over the age of 65.

It will be necessary for aging individuals to adapt their current homes as needed to remain independent as long as possible. Three quarters of elders over 65 suffer from chronic illness according to a report by the CDC. A report by the National Council on Disability found that 80 percent of elderly people were able to reduce their dependence on others through the use of assistive technology. There is still a tremendous need, however, for the development of simple and inexpensive technology solutions that enable aging people to remain independent in their homes for as long as possible. These solutions should allow for the retrofitting of existing homes rather than requiring new homes to be constructed. The devices and technologies that are developed must provide interfaces that meet the special needs of elders as they undergo natural declines in physical and cognitive abilities.

These problems are being addressed by a large number of researchers around the world. Many of the proposed solutions are designed around off-the-shelf personal computers. For a variety of reasons, this is a good news, bad news situation. The good news is that affordable solutions are being created; the bad news is that these solutions are negatively impacted by the growing complexity, poor stability and built-in obsolescence that underpins the personal computer industry.

Proposed solutions

In order to maintain their independence and stay in their homes, aging people will need assistance with tasks such as housekeeping, nutrition, healthcare, managing finances, and leisure activities. Currently proposed strategies for improving health and safety for aging people are based on home visits by qualified specialists and on modifying the homes to compensate for declining physical abilities. After researching the changing needs of older Hawaiians, the State of Hawaii Executive Office on Aging developed *The Hawaii State Plan on Aging(2004-2007).*

The Archimedes Project at the University of Hawaii is developing solutions that focus on empowering aging individuals and minimizing dependency on outside agencies. The Archimedes solution is based on the concept of lifelong learning. Individuals are

provided with technology that teaches them to recognize each new need as it arises and to quickly learn new coping options. Archimedes researchers are developing a new assistive technology called the Ho'alauna Tablet ("Good Neighbor) specifically to solve many of the problems facing aging people. It directly addresses many of the recommendations made in *The Hawaii State Plan on Aging(2004-2007)*.

The Ho'alauna Tablet uses newly developed Human/Computer interaction strategies that completely hide the internal complexity of the system thereby making it much simpler to set up and use than conventional computers. In addition to teaching the person how to cope with needs, however, the Ho'alauna Tablet also incorporates the technologies required to actually perform many of the tasks that are encountered in daily living.

- Physical, cognitive and memory capabilities impaired by the aging process are augmented by well proven assistive technologies originally developed for people with disabilities;
- The frustrations of not being able to manipulate the control knobs and buttons on commercial appliances, entertainment equipment and IT devices are reduced by personalized remote control interfaces.
- The confusion and difficulty of learning how to operate new appliances and entertainment devices is replaced by consistent and easily understood user interfaces and remote control functions provided by the Ho'alauna Tablet;
- Problems caused by forgetfulness are minimized by an easily understood and easily used information storage and retrieval system.
- The frustrations of trying to remain organized while society is speeding up and placing more organizational demands on individuals are reduced by a smart scheduling system that adapts to changing needs or missed appointments;
- The complexities and constant changes of conventional computers are replaced by stable, easily understood interfaces that are easily customized to individual language, needs, abilities, preferences and culture.
- Being overwhelmed by too much irrelevant information while using the Internet is replaced by structured selection processes that access local Internet resources to obtain personalized and localized information such as the bus schedule for the person's actual bus stop or shopping information from the shops they actually use.
- The difficulties of managing personal finances are reduced by easily understood interfaces to local banking and bill paying services.
- Losing touch with caregivers, family and friends is overcome by freely available and easily used audio and video communication strategies.
- Security problems are minimized by intelligent software that recognizes exceptions to normal behavior and activities. Emergency assistance can be provided by automatically alerting family members or professional service providers.
- Medical problems caused by taking the wrong medication or forgetting to take medication at the correct time are minimized by a "Pill minder" that manages

the medication schedule and reminds the person when to take each of their medications.

- Isolation and boredom are reduced by providing access to many different local and Internet-based individual or group activities.

Summary of Goals for the Ho'alauna Tablet

The primary goal of the Ho'alauna Tablet project is to provide seniors living in Hawaii with a simple home device that allows them to:

1. Communicate with family members, friends, and health care workers at any time and from any location using text, voice and/or video,
2. Access local web-based information in their native language without extensive web searches,
3. Control home technology and environmental control devices,
4. Receive emergency information and assistance,
5. Keep track of health related information and schedules, and
6. Participate in community events, online games, social events, and educational programs.

The secondary goal for the Ho'alauna Tablet project is to involve Hawaiian teenagers and young adults in activities that provide opportunities for them to learn about the needs of their elders through:

1. Teaching elderly people to use the Ho'alauna technology,
2. Assisting in the production of personalized web pages containing local community content.
3. Providing training in simple home modification and environmental control technologies that work in conjunction with the Ho'alauna Tablet to help elders remain independent in their own homes, and
4. Assisting the State of Hawaii to support low-cost programs for helping elderly people to maintain their health, safety, well being, independence, and community involvement.

What is the Ho'alauna Tablet?

The Ho'alauna Tablet is a combination of specialized software and a highly simplified tablet computer. The Archimedes Project is developing specifications for a purpose-designed, low-cost tablet device optimized for this purpose. Until this tablet becomes available, the software can be used on conventional tablet computers, hand-held devices such as a Palm or CE Personal Data Assistant (PDA), or on any standard personal notebook or desktop computer. The requirements are that the device can connect to the Internet from time to time, and has the ability to display Macromedia Flash content. Future research will explore possibilities for implementing the technology in a "set-top box" or video gaming console that uses a television as a display device.

The researchers who developed the Ho'alauna Tablet have drawn on many years of experience with disability access tools and augmentative communication devices as well as interviews with many aging individuals and caregivers. The primary design target is to create a system that is very simple to use without making it dumb. The design has also been heavily influenced by wish lists we received from elderly people.

- "Make things simpler,"
- "It used to be easy when TVs had a rotary channel selector,"
- "I don't know anything about computers,"
- "I am frightened to use a computer because I might break it,"
- "I can never remember how to do complicated things,"
- "I can't read the tiny writing on the screen,"
- "I can't use the mouse to click on tiny icons,"
- "I am frightened that it won't work in an emergency when I really need it,"
- "My grandson taught me to surf the web but I get more information than I can handle,"
- "I can't afford an expensive system that is going to quickly go out of date anyway,"
- "Why does every program I try to use require me to learn a different way to do the same things?"

The Ho'alauna Tablet addresses all of these concerns and many more using a simple personalized interface that presents information and options in a consistent manner that provides everything the person needs in one place:

- Simple, easy-to-use email capabilities
- Simple access to local and web-based information
- Simple, easy-to-use remote control for devices such as home appliances, Audio/Visual systems, and environmental controllers.
- Simple, easy-to-use planning and adaptive scheduling.

A core technology has been developed that can be localized by language, neighborhood, individual activities and personal preference. Accessibility issues such as low vision, hearing loss, cognitive decline, or lack of familiarity with technology are addressed in the design specifications.

The intended capabilities of the Ho'alauna are summarized in the following table. Full implementation will take several years.

	Content areas	Description
1.	Communications	Access to e-mail, instant messaging, online chat rooms, and telephone service using Voice-Over-Internet-Protocol (VOIP), Video Phone communications using built-in video camera
2.	Links to local community web sites	Local internet resources provided in native languages for non-English speaking elders.
3.	Home environmental control	Interfaces to home appliances and audio-visual systems that use the Archimedes iTASK system to enable users to control devices using their own words.
4.	Personalized scheduler	In addition to the familiar scheduling capabilities of a hand held computer, such as a Palm Pilot, the Ho'alauna scheduler incorporates advanced strategies for automatically adapting the schedule to accommodate changed or missed appointments.
5.	Address and phone book	A simplified address and phone book is provided along with access to web based directories and yellow pages.
6.	Stuff Tracker	An advanced database system keeps track of all of a user's electronic documents and information resources, plus physical documents, and physical objects. The key innovation with this is a highly simplified saving, searching and retrieval strategy that hides all of the database complexities.
7.	Healthcare	Medical records, medication regime, medication management, Doctor information, attendant information, interface for real-time physiological monitoring and telemedicine.
8.	Security	Monitor and Emergency Information Communicator
9.	Distance Education Interface	A comprehensive, context sensitive help system provides on-demand learning.
10.	Online gaming	A variety of games and puzzles are incorporated to help the user to keep mentally alert. Interactive multi player games help fight loneliness by enabling users to interact with their friends even when they are house bound.
11.	Augmentative communication system	Limitations in a user's ability to use the Ho'alauna tablet due to physical, visual or hearing problems are offset by accessible interfaces originally designed for individuals with disabilities.

Figure 2. shows a screen shot of the a Local Information page on the prototype Ho'alauna tablet. Note the use of large rectangular buttons for selecting options. Unlike the GUIs, on most of the current computer s and PDAs, the Ho'alauna tablet does not change the position or size the buttons in arbitrary ways. Users can rely on selections always being in the same location. The prototype interface includes a simulated rotary selector knob on the black panel at the bottom of the screen. This was incorporated in response to a frequent observation by older people that it used to be much easier to use things that had knobs you simply turned to select a channel or set the volume, and so on. The production version will have a physical knob for selector screens or objects on a screen.

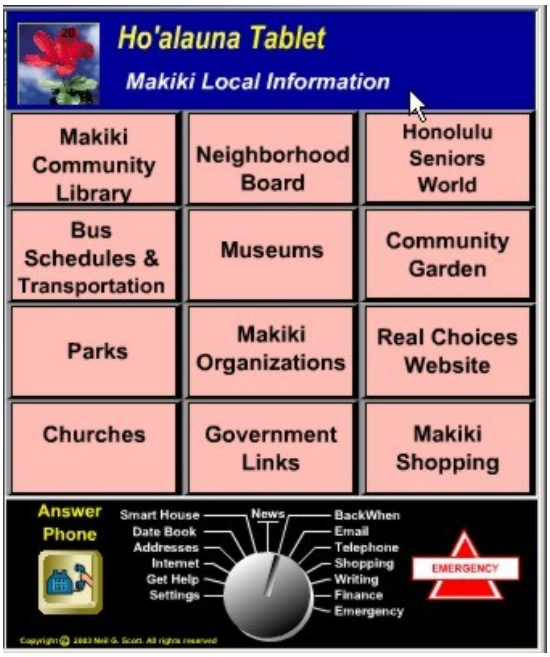

Figure 2. Sample of Ho'alauna local information screen display

The bottom panel also includes two buttons that are always available: A button for answering the telephone or making a call, and an emergency button that immediately takes the user to a screen with buttons that display what to do for heart attack, poisoning, stroke, home invasion and so on.

There is no limit on the number of screens that can be included in the tablet. In this example, each button can link to sixteen buttons and each of those to another sixteen, and so on. A large part of the ongoing development effort is focused on finding out how much information needs to be immediately available and what information can be provided over the web.

Figure 3. shows a screen that provides access to remote control of a TVs, lamps and VCRs. Subsequent screens show the control functions available for each of the major categories. Note that the Telephone and emergency buttons are still available in the same positions on this screen. The smart house controller in the prototype system controls lamps and appliances using low cost control devices such as the X-10 modules that can be purchased from Sears or Radio Shack. This makes it very easy for seniors to implement their own environmental control technologies without having to pay someone to come out to make changes to the system.

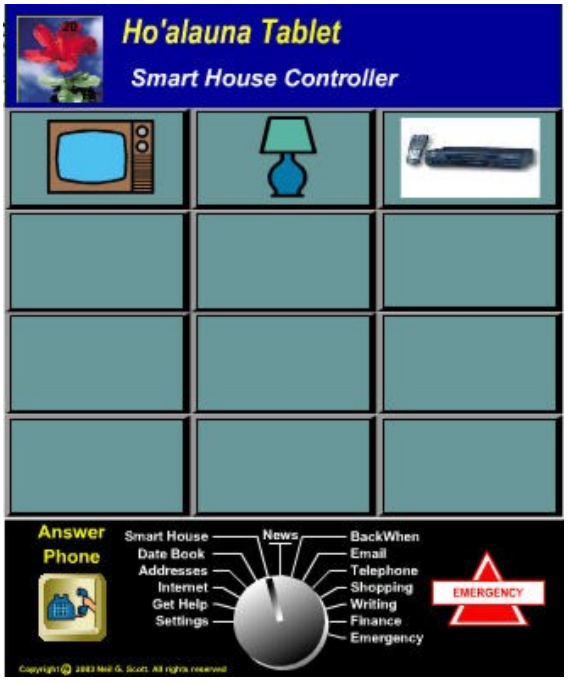

Figure 3. Sample of Ho'alauna remote control screen display

